REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 1- 7 and 9-55 are in this case. Claims 1-7 and 9-55 have been rejected. Claims 1, 15, 29, 42 and 46 have now been amended. Claims 2, 19, 20, 30 and 47 have now been cancelled.

35 U.S.C. § 112, Second paragraph Rejections

The Examiner has rejected claims 19, 26 and 46 under 35 USC § 112, second paragraph, as being indefinite for failing to point out an distinctly claim the subject matter which applicant regards as the invention. The Examiner's rejections are respectfully traversed. Claims 19 and 46 have now been amended.

The Examiner has stated that in claim 19, 26 and 46, the phrase "said second unharvested plant" lacks prior antecedent basis. Regarding claim 19, the Examiner has further stated that the phrase "said at least one selection criterion" also lacks prior antecedent basis.

Regarding claim 26, Applicant believes that the Examiner is mistaken in his rejection. Applicant wishes to point out that claim 26 depends directly from claim 16, which recites:

> "The method of claim 15, further comprising:
> (d) selecting a second unharvested plant, said second unharvested plant being a reference plant to said first unharvested plant;"

thus providing proper antecedent basis for the phrase "said second unharvested plant" recited in claim 26.

Regarding claim 19, Applicant wishes to point out that claim 19 also depends directly from claim 16 which, as described hereinabove, provides clear antecedent basis for the phrase "said second unharvested plant". Further, claim 19 has now been amended, replacing the phrase "said at least one selection criterion" with the phrase "at least one selection criterion", the amended phrase no longer requiring antecedent basis in a prior claim.

Regarding claim 46, Applicant wishes to point out that claim 46 has now been amended to depend from claim 43, which recites:

"The method of claim 42, further comprising:
(d) selecting a second unharvested plant, said second unharvested plant being a reference plant to said first unharvested plant;"

thus providing clear antecedent basis for the phrase "said second unharvested plant" recited in claim 46.

In view of the abovementioned arguments and amendments, Applicant believes to have overcome the 112, second paragraph rejections.

35 U.S.C. § 102(b) Rejections – Huguet et al (US 4,638,594)

The Examiner has rejected claims 1, 3-7, 9-15, 17-19, and 21-27 under 35 USC § 102(b) as being anticipated by Huguet et al. The Examiner's rejections are respectfully traversed. Claims 1 and 15 and have now been amended to include the limitataions of now cancelled claims 2 and 20, respectively. Claim 2 has been cancelled, and fully incorporated into currently amended claim 1.

Amending claims 1 and 15 to include the limitations of now cancelled claims 2 and 20, respectively, render claims 1 and 15 patentable over Huguet et al.

The Examiner states that Huguet et al disclose "a method of assessing a state of a field grown crop" comprising collecting data pertaining to at least one plant derived parameter over a predetermined portion of the growth cycle of the crop, effected by at least one sensor positioned on the plant of the crop, analyzing the data collected to identify a trend in the data over at least a portion of the growth cycle, the trend being indicative of the state of the crop. The Examiner further states that Huguet et al. teach correlating the trend to an environmental parameter, and communicating with a user client to modify the state of the plant (using an irrigation device). The Examiner further states that Huguet et al teach selecting a first and second plant, with sensors positioned on the second plant as well, according to one selection criterion (fruit size) for comparison of data to assess the state of a crop.

The present invention is of a method and system employing remote, plant-positioned sensors of specific plant parameters which can be used to determine and correlate trends indicative of a state of a crop, in real-time, for precise and accurate crop management. Applicant is of the strong opinion that Huguet et al. alone, nor in combination with the teachings of others, does not teach nor provide motivation

for the use of a system of identifying, correlating and acting upon such trends during crop growth.

Huguet et al. teach a "process for controlling irrigation of plant crops" effected by measuring daily variations in a parameter linked to water requirements and resources of a specific part of the plant, determining the maximal amplitude of daily variations in this parameter, fixing of a threshhold for the said parameter, and triggering the irrigation of the plant when the threshhold has been exceeded. Thus, triggering the irrigation, according to Huguet et al, is not in response to an analysis of data to determine a trend, as in the present invention, rather, is effected by a reduction in stem, fruit or trunk girth, below a predetermined threshhold.

Huguet et al teach the collection of data pertaining to changes in the girth of stem or fruit alone. In contrast to the Examiner's statement, no stem elongation rate data collection is disclosed. Further, contrary to the Examiner's contention, Huguet et al do not teach, nor imply, the correlation of the data regarding stem girth, etc, with any environmental parameter. Nowhere in the claims, or in the specification, are apparati or sensors suitable for measuring environmental parameters, analysis of environmental data, or correlation of the plant-related data to environmental parameters described. Indeed, Huguet et al teach away from such correlation, stating in column 6, lines 7-10:

> "It will be noted that there is no need to detect the climactic parameters, since the plant itself acts as a sensor, and integrates all the parameters useful to it..."

Thus, this feature of the present invention is neither described nor suggested by the prior art. Applicant is of the opinion that one of ordinary skill in the art would not be motivated by the teachings of Huguet et al, neither alone, nor in combination with the teachings of others, to make or use methods for precise and accurate crop management employing remote, plant-positioned sensors of specific plant parameters which can be used to determine and correlate trends indicative of a state of a crop, and further correlate these trends to enviromental parameters.

To further distinguish the present invention from prior art, and to expedite prosecution in this case, as agreed in the telephone interview of

December 9, 2003, claims 1, 15, 29 and 42 have now been amended to include the language of dependent claims 2, 20, 30, and 47, respectively, which recite the limitation of collecting data pertaining to at least two plant derived parameters, analyzing the data to identify trends, and correlating said data from at least two plant derived parameters:

> Claim 1. A method of assessing the state of a field grown crop comprising:
> (a) collecting data pertaining to at least one plant derived parameter over a predetermined portion of the growth cycle of the crop, wherein said collecting is effected by at least one sensor positioned on a plant of the crop and whereas the crop is unharvested, and
> (b) analyzing said data collected over said predetermined portion of the growth cycle to thereby identify a trend in said data over at least a portion of said growth cycle, said trend being indicative of the state of the crop; and
> (c) correlating said trend to an additional trend derived from data pertaining to an additional plant derived parameter collected over said predetermined portion of the growth cycle of the crop.

Thus, according to the method taught in currently amended claim 1, correlation of the trends exhibited by more than one plant-derived parameter is needed to assess the state of the crop. Such a method would clearly provide important information unattainable from recording of data from single parameters, as taught by Huguet et al. [Indeed, the Examiner has noted that where Huguet et al teach the collection of data from more than one plant, they specify the collection of data pertaining to an identical parameter in all trees (see Note on page 4, paragraph 8 of Paper No. 6, dated August 13, 2003)]. For example, trends of transpiration state, as measured by sap flow (stem flux relative rate), can be correlated to trends of second parameters such as leaf, flower and/or fruit temperature, to more accurately determine cultivation conditions, and optimal time of harvest.

The collection of data, and correlation of trends from at least two plant derived parameters is recited in (now canceled) claims 2, 20, 30 and 47:

> "The method of claim 1(15, 29, 42), further comprising the step of correlating said trend to an additional trend derived from data pertaining to an additional plant derived parameter..."

Thus, the methods taught in currently amended claim 1, 15, 29 and 42, and claims directly and indirectly depending therefrom, now include the collection of data from at least two plant derived parameters, analysis of trends from said data, and the correlation between said trends, to assess the state of the plants, said correlations being indicative of the state of the crop.

Applicant wishes to further point out that the phrase "plant derived parameters", as used in the instant specification, relates to data originating from measurements performed on a plant, as distinguished from data originating from measurements of the environment of the plant. Examples of such plant derived parameters, in contrast with environmental parameters, are detailed in the Table set forth on pages 15 and 16 of the instant specification:

Various parameters useful for trend extraction

Data	Values and characteristics
Measured environmental data	– solar irradiation (global, photosynthetic) – air temperature, – air humidity, – leaf boundary layer diffusion resistance, – wind speed – soil (substratum) temperature, – soil (substratum) moisture. – CO2 concentration
calculated environmental related data	– thermal time (amount of physiologically active temperatures), – dew point temperature, – surface wetness duration – amount of light, – water vapor pressure deficit, – potential evapotranspiration.
	– leaf temperature,

Measured plant related data	– flower temperature, – fruit surface temperature, – stem flux relative rate, – stem diameter variations, – internode growth rate, – stem growth rate, – fruit growth rate, – CO_2 exchange of leaves.
Calculated plant related data	– leaf-air temperature difference, – leaf and/or fruit temperature in relation to the dew point temperature, – stem diameter daily contraction, – daily maximum stem diameter evolution, – daily fruit increment, – plant water stress index, – light curve of photosynthesis, – daily CO_2 balance of leaves.

Applicant is of the strong opinion that, considering the objective evidence and amendments detailed hereinabove, the methods for assessing the state of a crop as described in the instant invention are clearly distinguished from the process for controlling irrigation of plant crops taught by Huguet et al in both scope and content.

As such, it is Applicant's strong opinion that Huguet et al. do not anticipate nor render obvious the present invention as claimed.

35 U.S.C. § 103(a) Rejections – Huguet et al, in view of Gardner et al.

The Examiner has rejected claims 2, 16 and 20 under 35 USC § 103(a) as being unpatentable over Huguet et al in view of Gardner et al. (US 4755942). The Examiner's rejections are respectfully traversed. Claims 2 and 20 have now been canceled and fully incorporated into currently amended claims 1 and 15.

The Examiner has stated that, regarding claims 2 and 20, although Huguet et al do not specifically teach correlating the trend from one tree to a trend from another tree, Gardner et al teach a method of assessing the state of a crop with similar steps as that of Huguet et al, also mentioning correlating a trend of one plant to another plant of the crop, thus rendering obvious the incorporation of trends in order to study the trend of all plants in the field. It is Applicant's strong opinion that the Examiner

has misunderstood the present invention as claimed, and the essence of the prior art documents cited.

The present invention is of a method for methods for precise and accurate crop management employing sensors of specific plant parameters, parameters that can be used to determine and correlate trends indicative of a state of a crop without having to resort to prior experimentation or expert interpretation of data collected from the plant or environment. Throughout the claims the phrase "plant derived parameter" is cited, referring to data originating from measurements performed on a plant, as opposed to measurements of environmental parameters. This distiction is clearly drawn in the instant specification on page 14, line 21, to page 15, line 2:

> Plant parameter data from which trends can be extracted include, but is not limited to, leaf temperature data, flower temperature data, fruit surface temperature data, stem flux relative rate data, stem diameter variation data, fruit growth rate data, leaf CO_2 exchange data and the like.

and page 15, lines 9-13:

> Environmental parameter data from which trends can be extracted include, but is not limited to, air humidity data, air temperature data, solar radiation data, a boundary diffusion layer resistance data, soil moisture data, soil temperature data, vapor pressure deficit, potential evapotranspiration and the like.

and reiterated throughout the instant specification and claims. Examples of such plant derived parameters, in contrast with environmental parameters, are detailed in the Table set forth on pages 15 and 16 of the instant specification:

Various parameters useful for trend extraction

Data	Values and characteristics
Measured environmental data	– solar irradiation (global, photosynthetic) – air temperature, – air humidity, – leaf boundary layer diffusion resistance, – wind speed

	– soil (substratum) temperature, – soil (substratum) moisture. – CO2 concentration
calculated environmental related data	– thermal time (amount of physiologically active temperatures), – dew point temperature, – surface wetness duration – amount of light, – water vapor pressure deficit, – potential evapotranspiration.
Measured plant related data	– leaf temperature, – flower temperature, – fruit surface temperature, – stem flux relative rate, – stem diameter variations, – internode growth rate, – stem growth rate, – fruit growth rate, – CO_2 exchange of leaves.
Calculated plant related data	– leaf-air temperature difference, – leaf and/or fruit temperature in relation to the dew point temperature, – stem diameter daily contraction, – daily maximum stem diameter evolution, – daily fruit increment, – plant water stress index, – light curve of photosynthesis, – daily CO_2 balance of leaves.

Thus, claims 2 and 20, which teach the methods of claims 1 and 15, respectively, with the additional limitation of:

> "...further comprising the step of correlating said trend to an additional trend derived from data pertaining to an additional plant derived parameter..."

teach the correlation of trends derived from one plant derived parameter with trends derived from another plant derived parameter, and not, as asserted by the Examiner, the correlation of trends from one plant to other plants. Thus, it is the Applicant's strong opinion that claims 2 and 20 cannot be anticipated nor rendered obvious by the methods of Huguet et al in combination with Gardner et al, and as such have been erroneously rejected under 35 USC § 103(a) as being unpatentable

over Huguet et al in view of Gardner et al.

Further, it is Applicant's strong opinion that, contrary to the Examiner's contention, Gardner et al fail to teach a method for assessing a crop with similar steps to that of Huguet et al.

Gardner et al teach a method and apparatus for controlling irrigation of a crop from calculations of water stress conditions of the crop. The methods and apparati described by Gardner et al for calculating water stress employ measurements of crop canopy temperatures, air temperatures, and humidity. Measurement of crop canopy temperature, air temperature and humidity are performed, as taught by Gardner et al, by a field installed unit monitoring one location, or by a user client, carrying a sensing device through the crops, using environmental sensors such as the "infrared thermometer for sensing crop canopy temperature" and the "temperature and humidity sensors for sensing ambient temperature and relative humidity..." as recited in claims 1 and 9 of the cited prior art. Crop canopy temperature is commonly lower than ambient temperature, due to transpiration at the leaf surfaces. By definition, and according to Gardner et al, crop canopy temperature is not measured on the plants, but at the air interface between the crop canopy (various locations above the upper leaves of a crop) and the ambient air. Although these measurements may be taken from a plurality of locations in the crop, crop canopy temperature is not a plant derived parameter, thus the methods of Gardner et al do not provide measurements of trends of plants in a field, or all plants in a field, as asserted by the Examiner. Further, the fixed or portable devices taught by Gardner et al for measurement of such environmental parameters would counterintuitive to the collection of data pertaining to changes in the girth of stem or fruit of trees as taught by Huguet et al., since, as mentioned hereinabove, Huguet et al specifically exclude the detection of climatic parameters from the methods of their invention. Thus, one of ordinary skill in the art would not be motivated to combine the teachings of Gardner et al, with those of Huguet et al., to measure, analyze and correlate trends of more than one plant derived parameter to assess the state of a crop.

To further distinguish the present invention from prior art, and to expedite prosecution in this case, as agreed in the telephone interview of December 9, 2003, claims 1 and 15 have now been amended to include the language of dependent claims 2 and 20, respectively, which recite the limitation of collecting data pertaining to at least two plant derived parameters, analyzing the data to identify trends, and correlating said data from at least two plant derived parameters:

> Claim 1. A method of assessing the state of a field grown crop comprising:
> (a) collecting data pertaining to at least one plant derived parameter over a predetermined portion of the growth cycle of the crop, wherein said collecting is effected by at least one sensor positioned on a plant of the crop and whereas the crop is unharvested, and
> (b) analyzing said data collected over said predetermined portion of the growth cycle to thereby identify a trend in said data over at least a portion of said growth cycle, said trend being indicative of the state of the crop; and
> (c) correlating said trend to an additional trend derived from data pertaining to an additional plant derived parameter collected over said predetermined portion of the growth cycle of the crop.

Thus, according to the method taught in currently amended claims 1 and 15, correlation of the trends exhibited by more than one plant-derived parameter is needed to assess the state of the crop. Such a method would clearly provide important information unattainable from recording of data from single parameters, as taught by Huguet et al., or from the measurement of environmental parameters as taught by Gardner et al.

The collection of data, and correlation of trends from at least two plant derived parameters is recited in (now canceled) claims 2 and 20:

> "The method of claim 1(15), further comprising the step of correlating said trend to an additional trend derived

from data pertaining to an additional plant derived parameter..."

Thus, it is Applicant's strong opinion that the methods taught in currently amended claim 1 and 15, and claims directly and indirectly depending therefrom, including the collection of data from at least two plant derived parameters, analysis of trends from said data, and the correlation between said trends, to assess the state of the plants, are patentable over the cited prior art.

The Examiner has further rejected claim 28 under 35 USC § 103 (a) as being unpatentable over Huguet et al as in view of Gardner et al, stating that "It would have been obvious to one of ordinary skill in the art...to select a first plant with more sensitivity to change than a second plant..., because it would be wasteful and costly study on how environment affect plants if one were to select a perfect plant which is not prone to any environmental effects..." The Examiner's rejection is respectfully traversed. Applicant wishes to point out that neither the Hugeut et al nor Gardner et al teach or imply the monitoring of plant derived parameters from sample plants or trees differing in any way from the crop in general. Regarding the Examiner's assessment of the wastefulness, costliness and senselessness of studying only one tree out of a plurality of trees in a field, this is merely statement of an opinion, without providing objective basis. Further, USC 103(a) determines criteria for nonpatentability as: "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art". The wastefulness, costliness and senselessness of an invention do not stand in contradiction of non-obviouness. Further, co-cultivation of a first plant with a second plant, and the monitoring of trends therefrom, requires a method for monitoring trends of plant derived parameters from a plurality of plants and correlating between the trends, and such a method is taught neither by Huguet et al alone nor in combination with Gardner et al. Thus, Applicant believes that the method of claim 28 is neither anticipated nor rendered obvious by the cited prior art.

35 U.S.C. § 103(a) Rejections – Huguet et al, in view of Weller et al.

The Examiner has rejected claims 29, 31-42, 44, 46-52, 54 and 55 under 35 USC § 103(a) as being unpatentable over Huguet et al in view of Weller et al. (US 4647533). The Examiner's rejections are respectfully traversed. Claims 30 and 47 have now been canceled and fully incorporated into currently amended claims 29 and 42.

The Examiner has stated that "it is notoriously well known...that a crop can be grown in a greenhouse first and then planted in the field later..." and that Weller et al teach that a crop is grown first in a greenhouse and then later planted in a field. Applicant wishes to point out that a close reading of the prior art discloses that Weller et al teach a method for the screening of strains of bacteria potentially suppressive of Pythium spp. in field conditions. The screening, as taught by Weller et al., comprises the steps of isolating potentially protective strains of fluorescent Pseudomonads, soaking seeds of grain crops in suspensions of the candidate bacteria, growing said grain crops in a greenhouse, under controlled conditions, selecting effective strains, and then testing the selected bacterial strains on seeds of grain crops under field conditions. Plants are measured to assess the effectiveness of the individual bacterial strains in supressing Pythium spp. growth. Nowhere do the present invention, Huguet et al or Weller et al teach or imply the growing of a crop in a greenhouse at early stages of growth and their replanting in a field later, as asserted by the Examiner (page 7, paragraph 2 of Paper No. 6), because some crops are sensitive to weather conditions and better grown in a greenhouse first until they are strong enough to be planted in the field. Thus, one of ordinary skill in the art would not be motivated to combine the methods of bacterial strain selection taught by Weller et al with the methods of controlling irrigation taught by Huguet et al., to select a greenhouse grown crop.

Claims 29-55 relate to novel methods of assessing the state of a greenhouse grown crop by collecting, from individual plants of the crop, data pertaining to plant derived parameters, and analyzing the data, in a variety of ways, to determine trends indicative of the state of the crop. While the growth of crops in a greenhouse is a well known method in agriculture, the assessment of the state of crops, field grown or greenhouse grown, by analyzing trends derived from plant

derived parameters, as disclosed in the present invention, is novel and non-obvious over the cited prior art.

To further distinguish the present invention from prior art, and to expedite prosecution in this case, as agreed in the telephone interview of December 9, 2003, claims 29 and 42 have now been amended to include the language of dependent claims 30 and 46, respectively, which recite the limitation of collecting data pertaining to at least two plant derived parameters, analyzing the data to identify trends, and correlating said data from at least two plant derived parameters:

> Claim 29. A method of assessing the state of a greenhouse grown crop comprising:
> (a) collecting data pertaining to at least one plant derived parameter over a predetermined portion of the growth cycle of the crop, wherein said collecting is effected by at least one sensor positioned on a plant of the crop and whereas the crop is unharvested, and
> (b) analyzing said data collected over said predetermined portion of the growth cycle to thereby identify a trend in said data over at least a portion of said growth cycle, said trend being indicative of the state of the crop; and
> (c) correlating said trend to an additional trend derived from data pertaining to an additional plant derived parameter collected over said predetermined portion of the growth cycle of the crop.

Thus, according to the method taught in currently amended claims 29 and 42, correlation of the trends exhibited by more than one plant-derived parameter is needed to assess the state of the crop. Such a method would clearly provide important information unattainable from recording of data from single parameters, as taught by Huguet et al., alone, or in combination with Weller, et al.

The collection of data, and correlation of trends from at least two plant derived parameters is recited in (now canceled) claims 30 and 46:

"The method of claim 29(42), further comprising the step of correlating said trend to an additional trend derived from data pertaining to an additional plant derived parameter..."

Thus, it is Applicant's strong opinion that the methods taught in currently amended claims 29 and 42, and claims directly and indirectly depending therefrom, including the collection of data from at least two plant derived parameters, analysis of trends from said data, and the correlation between said trends, to assess the state of the plants, are patentable over the cited prior art.

The Examiner has further rejected claims 55, 30, 43, 45 and 53 under USC 103 (a) as being unpatentable over Huguet et al as modified by Weller. The Examiners rejections are respectfully traversed. Regarding the rejection of claims 30, 43, 45 and 53, Applicant wishes to call attention to arguments brought hereinabove relating to Huguet et al in combination with Weller et al. Regarding claim 55, Applicant wishes to reiterate the arguments brought hereinabove for claim 28.

In view of the above amendments and remarks it is respectfully submitted that independent claims 1, 15, 28, 29, 42 and 55, and all claims which directly or indirectly depend therefrom are now in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,

Sol Sheinbein
RegistrationNo. 25,457

Date: December 11, 2003.

Encl.
One month extension fee; and
Summary of Interview.